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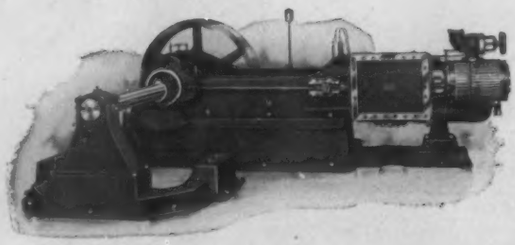

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VOLUME XXIII. SAN FRANCISCO, JULY 31, 1909 NUMBER 5

THE WENATCHEE ELECTRIC COMPANY.

Situated at the junction of the Wenatchee and the Columbia rivers, on the line of the Great Northern Railway, in the center of the great State of Washington, is the thriving town of Wenatchee, which, according to Indian legion, signifies "the place of the rainbow robe," and refers to the beauty of this snow-fed river. brilliant verdure the thirsty plains once gray-green with sage-brush. Thirteen thousand acres of land already have water for irrigation, of which five thousand are in bearing orchards. The excellent appearance and fine keeping qualities of the apples and peaches produced in this district find them a ready

Twin Lakes Reservoir of Proposed Icicle Power Plant, Wenatchee Electric Company.

Tributary to the town are thousands of acres of the most fertile soil, not a tithe of which have yet been transformed by the magic wand of water into the productive orchards which cluster around the town and the wide fields of grain which flank the hillsides. Towering to the west is the snowy range of the Cascade mountains, on whose peaks are condensed the moisture which otherwise would make unnecessary the numerous irrigation projects that are clothing with market and the prosperous farmers are now seeking all the modern conveniences made available by electric power.

An integral pioneer part in this beneficent development is occupied by the Wenatchee Electric Company, which is supplying power for irrigation, milling and lighting to Wenatchee and surrounding territory. A hydro-electric plant has been installed on Quil-toe creek close by, and a steam and gas power plant is

held as a reserve in the town. One thousand kilowatts are also being supplied to its distributing system by the Valley Power Company, an allied concern which is under contract to supply fifteen thousand kilowatts additional as the demand warrants. The Wenatchee Electric Company also controls the water rights on Icicle river and Snow creek which flow into the Wenatchee river, with a fine reservoir site at Twin lakes. This can be readily developed to yield a minimum of 8000 h. p. under a head of 1450 feet.

Hydro-Electric Plant, Wenatchee Electric Company.

The company's hydro-electric plant on Quil-toe creek, four and one-half miles south of Wenatchee, is equipped with two 180-k. w., three-phase, 60-cycle, 2200-volt Westinghouse generators, driven by a 360-h. p. Pelton water wheel under a head of 780 feet. The power thus generated is transmitted at 11000 volts to the transformer house in town where it is stepped down to 440, 220 and 110 volts for local distribution. At the time of peak load and as a reserve, 300 k. w. can be supplied from the gas and steam plant in the town. The company is also supplied by power as before mentioned, from the Valley Power Company, whose plant is 20 miles up the Wenatchee river. This plant originally consisted of a 115-k. w., 6000-volt, Westinghouse, three-phase generator, to which has been added during July, 1909, 1000 k. w. additional. The accompanying views show the diverting dam, canal, pipe line and power house exterior. Arrangements have been made for supplying 1500 k. w. more 500 k. w. units as needed.

Mr. H. Remley is superintendent of the Valley Power Company and has had charge of all construction work. The ditch is being materially enlarged by means of a dredge to meet future demands. The power house as well as the transformer house are substantial concrete structures. McCormick wheels furnish the power and Westinghouse generators, transformers and switchboard apparatus are used. Mr. Arthur Gunn is president and manager of the Wenatchee Electric Company, as well as the telephone company which supplies service throughout the town and surrounding country.

These plants are of interest, not because of their present size, but because of their possibilities in supplying the needs of an irrigated section that seems destined to as great a development as the San Joaquin valley in California, the Rogue River valley in Oregon and the Yakima valley in Washington.

Transformer House, Gas House, City Power House and Sub-Station, Wenatchee Electric Company.

THE LOAD DISPATCHING SYSTEM OF THE PACIFIC GAS AND ELECTRIC COMPANY.

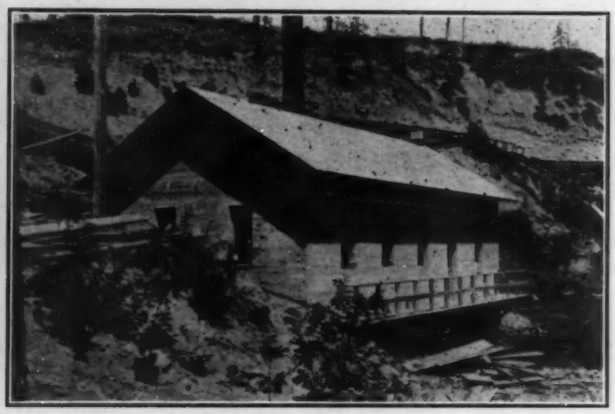
BY P. M. DOWNING.[1]

In the operation of an electrical system the objects first to be considered are continuity of service and regulation of voltage. With a system having but few sources of supply, and these located near together, the problem is a comparatively simple one, but as the number of generating stations is increased, and lines are added until they form a network extending for hundreds of miles, the problem becomes more complicated.

Valley Power Company's Dam in Wenatchee River.

Valley Power Company's Canal.

Penstock at Power House.



Concrete Power House.

The system of the Pacific Gas and Electric Company is unique in that it has a greater mileage of high voltage lines receiving power from a larger number of sources than any other system in the world.

Not only do the ten hydro-electric power houses of this company, aggregating an installed capacity of approximately 67,000 kilowatts, all run in parallel, but they are connected in with and receive power from the Northern California Power Company, the Great Western Power Company, the Stanislaus Power Company, the Snow Mountain Water and Power Company, the steam stations at Oakland, San Jose, San Francisco, and the gas engine station at Martin.

On first thought it would seem that the regulation and handling of load under these conditions would be a difficult matter. On the contrary, it is very simple.

[1]Engineer of Operation and Maintenance, Pacific Gas and Electric Company.

The present method of operation has been a gradual development. It was early found that in order to operate successfully under these conditions, two things were essential:

First. That so far as handling the load and regulation of voltage was concerned, there should be but one person in authority.

Second. That there should be a perfect telephone service between the principal power houses and the important switching stations.

The Bay Counties Power Company was the nucleus of the present system, and for several years Colgate was considered the master plant. From this point was handled not only the speed and voltage regulation, but also the line switching of the entire system. This arrangement continued in effect until the extension of lines brought the important center of switching near Davis, and for a time the operators at that place, acting with Colgate, handled the work which had formerly been controlled entirely from Colgate.

With the taking over of the Standard Electric Company and the operation of that system in parallel with the Bay Counties, it became necessary to control the two systems from some point so far as possible common to the two. By virtue of its location, South Tower was selected as being the most suitable place, and from that point the load dispatching was handled until about a year and a half ago, when it was found advisable to relieve the regular station operators of this responsibility, and to create the position of load

dispatcher. Thus has the load dispatcher's office come to be the center of the operation of the entire system, from which every power house, switching station, etc., receives orders.

On the load dispatcher rests the responsibility of keeping the voltage normal and seeing that the fluctuations of load are properly taken care of among the different power houses. To do this requires not only a thorough knowledge of the power house conditions, but a knowledge of the character of the load on the system throughout the day, as this has a decided effect on the regulation of the lines.

A superintendent cannot take out of service a power house, transmission line, or any other part of the system which would affect the operation of the whole, without first receiving authority to do so from the load dispatcher's office. However, the division of load and regulation of voltage is by no means the most important part of the load dispatcher's duties; that of re-establishing service after an interruption, without unnecessary delay, is a far more difficult problem, and very often calls for quicker and more decisive action. Operating as we do with everything running in together on a common network consisting of approximately sixteen hundred miles of sixty kilo volt lines, trouble on any line will affect the entire system. Then it is that the load dispatcher is busiest. The trouble must be located and the particular section of line on which the trouble occurs must be cut out. The different generating stations may be thrown out of synchronism, or the trouble may even be so severe that the different machines in the power house may be thrown out of synchronism. If the trouble is far enough removed from the station, the generators will not be thrown out, and the interruption is therefore only momentary; nor is trouble on one part of the system always noticed over the entire system. This is taken care of by the system of switching in use, whereby immediately when trouble occurs the different power houses are separated, leaving one or more running together with such lines and load as they can conveniently carry.

An experienced operator can, from the sound of a transformer, motor, or regulator, at once tell when trouble occurs. If the station be a switching point, he should be able to handle the switching quickly enough for the trouble to show only as a slight momentary drop in voltage on the unaffected section of line. This conditon is possible by reason of the inductance and capacity of the line and would not obtain on shorter lines of higher conductivity.

Immediately after the operation of any high tension switch, either on a direct order from the load dispatcher's office, or during trouble when the regular routine tests are being made, such action is immediately reported to the dispatcher. In this office is located a board showing diagramatically every generating station, transmission line, sub or switching station, also every switch in any of these different stations or on the lines. Stations and lines are represented by being painted on the board, but the switches are represented by dummies which can be adjusted to show the switch open or closed. The particular kind of switch, i. e., whether oil or air, is shown by the shape of the dummy; the oil switches being circular and the air rectangular.

The advantages of a board of this kind will be appreciated when one considers that there are in service on the entire system, approximately one hundred and twenty-five oil and three hundred and fifty air switches, the position of every one of which must be known by the load dispatcher.

When an order is given to operate a switch no change is made on the board until the operator to whom the order is given reports that the order has been carried out, when the dummy switch is set accordingly. In this way a load dispatcher coming on watch can tell at a glance what lines are out of service and what switches are open or closed.

Thus will be seen the importance and necessity of reliable telephone communication, particularly between the dispatcher's office and the principal switching points.

Telephone circuits are run on all high voltage transmission lines and ordinarily these give very satisfactory service. Very often, however, they are of high resistance and not suitable for use over long distances on account of inductive troubles from the high voltage wires, which during times of trouble on the transmission are great enough to make the telephone entirely inoperative. They are, therefore, used only for the local service on that particular section of line, the more important business being carried over a line leased from the Pacific Telephone and Telegraph Company.

The leased line extends from the general office in San Francisco to the load dispatcher's office in Oakland, thence to South Tower, Stockton, Sacramento, Marysville and Chico. From Oakland a branch runs to Mission San Jose, where connection is made to a leased line of the Stanislaus Company. Branches run from South Tower to North Tower, from Stockton to Electra and from Sacramento to Davis. At Marysville our own private line from Colgate connects to the leased line and at Chico connection can be made to the private line from de Sabla and Centerville.

In the dispatcher's office is kept a careful record of the energy delivered from the different generating stations, and daily load curves are plotted showing (a) the load generated at our own water power plants; (b) the load generated at our own steam plants; (c) the power purchased, and (d) total load on system.

This information is completed between midnight and 8 a. m. for the twenty-four hours ending at midnight, and shown in the form of a daily service report which reaches the general office by 8:30 each morning.

In addition to showing the load conditions, this service report gives the time and duration of interruptions to service at any substation, weather conditions, rain or snowfall, depth of snow at different gauging stations, depth of water in storage reservoirs, amount flowing in ditches or over diverting dams, and such other information as may be of interest and importance.

This very important work is in the hands of three dispatchers, a dispatcher being on duty at all times. Mr. Fred R. George is chief dispatcher, assisted by C. P. Pierce and W. D. Skinner

CO-OPERATION BETWEEN CONTRACTORS AND THE CENTRAL STATIONS.[1]

BY GEO. C. HOLBERTON.

As the author notes from the printed program that this paper is to be written by the central station representative, he assumes that you desire to hear the central station end; in other words, that you are more particularly interested in what the central station would have the contractors do, rather than what the contractors would have the central station do.

If it were only necessary to write a paper from the contractor's standpoint in the matter, it would be very simple, because all the contractor desires is that the central station supply the consumer with motors free, which he would buy from the contractor and then give the contractor the job of wiring up the motor and running the service at actual cost, plus 20 per cent for possible profits and contingencies, and in order to make the proposition attractive, the company should, of course, give the consumer free current for the first year, and sell him current thereafter at whatever price the consumer thinks he would be justified in paying.

Unfortunately, the management and stockholders of the central station are always foolish enough to expect some profits, and to secure these and at the same time satisfy the consumer, is not as easy a problem as it might seem.

I think that in most cases the contractor, from the very nature of things, is first to come in contact with the consumer, and it is very important, therefore, that in dealing with the consumer, particularly those who are unfamiliar with the operation of electric motors and other devices, that the contractor use considerable diplomacy in making his initial statements. The consumer is mainly interested, first, in securing something that will do the work which he has to do; second, in doing it at a reasonable cost; and, thirdly, at a reasonable expense for his initial installation.

It is natural that the contractor should try to make these figures as attractive as possible, and in doing so, he unfortunately forgets that the line may not be in front of the consumers' premises, and the consumer may not have the service in his building, and if he does have a service, it may not be of the type proper to supply the cheapest form of motor; then, if the consumer has closed the deal with the contractor, he naturally feels very bad towards the central station, if he is told by them that he must put up several hundred dollars to extend the line, and that the motor he has is not of the right type, and that he must therefore change it at a still further cost, and so on along the line.

I feel sure that all central stations are only too willing to co-operate with the contractor in every way to give them the benefit of their experience, and to post them as to the current, voltage, etc., available at any point, and the contractor should therefore feel at liberty to call upon the central stations at all times for this information.

Another important thing for the contractor to bear in mind is the fact that the central stations have no favorites. They are in the business of selling current, and it makes no difference to them who sells the motor or secures the contract for the installation, as long as the motor is a properly constructed device which will operate with a minimum of trouble.

Evidently at times the failure of the contractor to get in closer touch with the central station has been due to the fact that they were dickering with a particular piece of business, and they feared it might leak out. Such a fear is, I think, unjustified, as any employee of the central station who used such information for the benefit of his friends would be dealt with summarily.

Many cases arise locally, in San Francisco and vicinity, where the prospective consumer may have used current at some other place, which place perhaps was under the same control, and if the contractor would co-operate with the central station, they might be able to post him as to the consumer's usage at his former place, and the type and kind of motor which he had, and also be able to give him some idea of his probable bills.

Consumers have a way of stating that they require so many horsepower and then asking how much this is going to cost if they operate 10 hours a day. If you were to multiply the number of horsepower by 746, divide this by the efficiency of the motor, and then multiply this by 10 for the number of hours operated, and then 26 for the number of days, you would get an imaginary consumption per month which would probably frighten the consumer out of doing business, and then, too, the case very rarely arises in which the consumer would have any such consumption. The contractor should therefore inquire very specifically into the type of installation that the consumer is to have and make of motor, and should refrain as much as possible from giving the consumer any figures as to his bills. If you make the probable bill too high, you naturally lose business, and on the other hand if you estimate the consumer's probable consumption too low, and he finds in reality that his bills are much higher than you estimated, you are only producing a dissatisfied consumer, so it is much better to point out the many advantages of the electric motor over other power, rather than dwell solely on the question of cost of current and by these other arguments such as attendance, low cost of up-keep, simplicity, freedom from fire risks, salability of his motor if he should discontinue its use, and a hundred and one other facts show him that the electric drive is the best thing for him.

I recall the case of a vegetable gardener, who came to see the writer in the matter of the installation of a motor for pumping purposes to displace a gasoline engine. His place was a long way from our service and the cost of running a line amounted to several hundred dollars, on top of which it was necessary for him to purchase a motor costing $150 or $200, and perhaps spend $50 for shafting, belts, etc., to drive his existing pump.

As the man appeared to be only a small vegetable gardener in moderate circumstances, I was almost afraid to talk figures with him, therefore dwelt upon the ease of handling, and told him how simple it would be to

[1]Paper read before Westinghouse Motor Dealers' Convention, San Francisco, June 14, 1909.

start and stop his pump, and when I finally reached the point where I was obliged to talk dollars and cents, he informed me that he did not care what the cost was as long as it worked, his expression being: "Justa naw when I wanta to sella de veg, I hava to go maka fixa de eng."

We installed the motor for him, and the writer personally visited the place some days later to ascertain how things were operating, and I found a very much pleased vegetable man, who informed me that his little girl did all of the pumping and that they were never obliged to go near the motor.

In San Francisco in particular, where so many types of current are available, it it very essential that the contractor determine the class of current available in every instance, as San Francisco has had a great deal of trouble with people buying direct current motors for operation in buildings where there was nothing but alternating current, and conversely, in buying two-phase motors when the only available current was direct current. The two are so mixed in this city that it is impossible to define the boundaries by districts, but the records of the San Francisco Gas and Electric Company are being put in such shape that the contractor can telephone to the office of the company and find out instantly what current is available at any address.

The contractor, when he sells a motor and receives his pay, is practically through with his consumer, but no so with the central station, and the contractor should realize this, and in making their sales bear this point in mind. The contractor naturally desires to sell as large a motor as possible. It means more business, hence more profit. He is also less apt to have trouble with the motor afterwards, but this, on the other hand, is distinctly bad for the central station and for the consumer. I say for the central station, because the consumer's interests are the central station's interests, and if he has too large a motor his bills are unnecessarily high and his minimum is unnecessarily large.

At the same time, the contractor cannot sell him too small a motor, because should the same be overloaded, and give trouble, he will have to bear the blame.

Referring back to my statements urging the contractor to keep in touch with the central station, brings up another necessity for this point. A consumer will, as you are all aware, hesitate some time before deciding to purchase a motor, but having so decided, he expects to get it started the next day, and if the contractor will keep in touch with the central station and advise them of the likelihood of the installation being made, they are better prepared to supply the consumer, and quickly make his connections; also getting in touch with the central station would determine the currest best available for any specific installation.

The contractor will in many instances save the consumer considerable expense by so doing, as, for instance, a consumer may have both direct current and alternating current available within the same distance, and the central station may have other extensions in mind which would make one or the other of these currents much cheaper for the consumer. In fact, the central stations often have applications on file in a particular district which were never put through due to the cost of the extension, and knowing this, the central station would be very glad to advise the contractor of these facts, and in place of losing a possible sale by notifying the central station, he would make two or more sales.

Another advantage in co-operation with the central station is that the central station may have upon its lines consumers of similar nature, and without divulging any secrets of its consumers, it might be able to give the contractor an idea of what the probable bills might be for the class of work which the consumer may be about to undertake. Further than this, the company has available a large amount of data, collected from various sources, covering the power required to drive tools of various types, all of which data the company would be glad to give to the contractor for use in figuring with consumers. This data is too large to embody in a paper of this class, but the writer would be very glad personally at any time to give the contractor the benefit of this information.

CONSERVATION AND COMMERCE.

The First National Conservation Congress of the United States will be held in the Auditorium of the Alaska-Yukon-Pacific Exposition, Seattle, Washington, August 26, 27, 28, 1909. Arrangements for the Congress are being perfected by the Washington Conservation Association, an organization comprising several hundred prominent men of the State.

"How shall the conservation of our natural resources be conducted so that business of the present day shall receive the greatest proper benefits?" This is the question presented by the Washington Conservation Association, and the Congress of practical, executive, professional and commercial men will be expected to answer in a manner satisfactory to the allied interests of the people.

The discussions will include the subjects of Irrigation, Dry Farming, Forestry, Mining, Transportation, Good Roads, Pure Food, Public Morals and Health, and the Relation of Capital to Labor in the work of modern Conservation.

The program includes addresses from the best thinkers of the age. Among those named as probable speakers are: President Taft, Hon. R. A. Ballinger, Secretary of the Interior; Hon. James Wilson, Secretary of Agriculture; Hon. Gifford Pinchot, Chief Forester; Hon. F. H. Newell, Chief of the Reclamation Service; Dr. W. J. McGee, Secretary of the White House Conference of Governors; Mr. Joseph E. Ransdell, President National Rivers and Harbors Congress; Dr. Charles W. Eliot, former President Harvard College; Prof. Irving Fisher of Yale; John Mitchell, Vice President American Federation of Labor; Hon. Seth Low, President National Civic Federation; Mr. James A. Emory, National Manufacturers' Association; Mr. James J. Hill, the great railroad builder, and many others.

The Washington Conservation Association has undertaken something new in the history of conventions.

ELECTROLYSIS.

Discussion by members San Francisco Section, A. I. E. E., June 25, 1909, following paper read by Elam Miller on "Electrolytic Corrosion of Telephone Cables," published in this journal July 10, 1909. The following took part in the discussion:

C. W. Burkett, Chief Engineer Pacific Telephone & Telegraph Co., Chairman.

W. J. Vincent Jr., Electrical Engineer with C. L. Cory.

S. G. McMeen, Engineer Home Telephone Company, San Francisco.

W. H. Seaver, American Steel & Wire Co., San Francisco.

A. H. Babcock, Electrical Engineer Southern Pacific Railroad.

S. J. Lisberger, Pacific Gas & Electric Co.

Elam Miller, Engineer with Pacific T. & T. Co.

L. E. Reynolds.

A. J. Pahl, City Electric Co., San Francisco.

A. J. Bowie Jr., Consulting Engineer, San Francisco.

B. C. Shipman, Electrical Engineer, Atlas Building, San Francisco.

The Chairman: Mr. Miller has given us a short paper on the effect of electrolysis on telephone cable sheaths. All metallic structures underground are subject to this same electrolytic action, and it was thought by the papers committee in this discussion to have a short talk or paper from the various people who might be interested in the electrolysis of water-pipes, gas-pipes, and possibly concrete buildings, or rather steel frame buildings, and also as relates to the bonding of street railways themselves, and methods of preventing it. Mr. Vincent has had some experience in handling this electrolytic work, or preventing electrolysis with respect to water-pipes, I believe, and we will be glad to hear from him.

W. J. Vincent: I have had some experience in a small way. Mr. Miller's paper on the telephone situation is very interesting, but it differs from the situation of gas and water companies in that the telephone companies are successfully coping with the situation by practically bonding their cables and putting a return to the power-house. The difficulty of this with the gas and water industries is, if they do that the current is liable to leave the pipe and go around every joint of the pipe, and we don't know where the electrolytic action is taking place. One ampere of current would, in a year's time, take about twenty pounds of iron out of the pipe, and it would take twenty pounds from any number of different places in the length of the pipe. And that is the difficulty and the difference between the situation of gas and electric companies and the telephone companies. The telephone company having a continuous path along the sheath of the cable, and the water companies having an interrupted path along the pipes, the question of making an electrolytic survey is a difficult one in a great many respects, and has to be made very carefully, for the reason that you cannot always judge by potential differences. The only accurate way to get at it is to measure the current actually flowing in the metallic structure underground; and to do this requires an accurate voltmeter and accurate instruments. In giving the potential between ground and the metallic construction, a voltmeter does not always measure it accurately on account of the contact you have to make. For instance, if you are making a contact with the voltmeter you have to watch out for the electro-motive force by polarization between the terminals and the ground. In making a test of the drop in current along the pipe it requires very accurate instruments, because the difference of potential is very small at different places. And then again the electrolysis survey for a water or gas system varies with the different conditions of load of the foreign current (the street railway it usually is), and it is liable to develop at different times of the day, one section of pipe being positive at one time of the load, and negative at another, and different days of the week. The load on Sundays and holidays will produce a different condition than other days, so it has to be made over quite a length of time and under different conditions to get an accurate result.

The Chairman: I supposed the great trouble was experienced by the telephone companies originally; probably the water companies and gas companies had some of it, but it was not nearly so noticeable, nor affected them so seriously as it did the telephone companies. For this reason it was thought that the discussion should be opened by a telephone engineer. We have with us tonight Mr. McMeen, and we would be very pleased to have him give us a talk on this subject.

S. G. McMeen: The problem of protecting a system of underground pipes, such as telephone cables or the like, from electrolytic corrosion is not a simple one. It does depend, however, on a simple, natural law. The complexity of the problem arises chiefly from the scattered nature of the things which cause the trouble and the things which suffer from it.

In reaching a practical solution for the protection of a telephone cable system, for example, the chief aim needs to be a determination of the differences of potential between the telephone cable sheaths and everything else. If all of the places where a positive potential on a cable sheath causes current to leave it can be arranged so that the leaving is wholly over a solid conductor, electrolytic damage may be prevented. And if such a system of correction does not introduce another in the way of actually overheating the cable sheaths by passing too much current through them, a solution may be said to have been reached.

Co-operation between the managements of traction systems and pipe-using systems is as important, it seems to me, as an activity on the part of the latter systems to protect their own underground conductors. Information upon the general practices of traction companies discloses a wide variety of states of mind with reference, at least, to the degree of responsibility the traction companies think they ought to bear. I am convinced that the solution of these problems will become simplest when co-operation has been more nearly perfected.

I have in mind an instance wherein a traction company, a telephone company and a municipality co-operated in nearly an ideal way. The interest of the city arose from its ownership and operation of a water system. The general plan of action having been determined before anything else was done, a system of protection was installed and has been found satisfactory to the interests having pipes which might have suffered, although the plan was inaugurated more than fifteen years ago.

Speaking generally, it may be said that the traction companies have contributed but little in the way of assistance toward either protective or preventive measures. In a very few instances, preventive measures have been utilized, and, so far as can be seen, with the result of lightening the burden upon the pipe-using companies in a great degree. It is my present opinion that the burden upon the traction company using preventive measures often may be found much less than the burden of protective measures which otherwise would have rested upon the pipe-using interests. If inquiry could show that this always is true, the only economic conclusion would be the increase of preventive means, however the actual cost of the preventive measures might be distributed among the interested concerns. It is only a case of determining what really is best, after a full analysis, as against starting with controversy as to who shall pay the cost.

Most discussions of this subject seem to be suggestive of the question of rail bonding, and frequently, in lodging a complaint concerning electrolytic corrosion, an attack is made upon the quality of the bonding of the tracks. It has not seemed to me that the relation between corrosion and bonds is so close as it may have seemed to others. In many cases, for example, the virtue of the general bonding scheme may be left out of consideration without affecting the character of the general preventive or corrective measures. One can recall cases wherein negative feeders, rail bonds and rail joints have been treated in broad ways independent of each other, with results approaching the best.

A recurrent agitation probably familiar to all of us is that of the alleged probable destruction of steel and reinforced con-

crete buildings, due to electrolytic corrosion of underground metal portions. I am sure we should all be entertained by any testimony of a practical nature as to when certain of our new and presumably excellent San Francisco buildings shall fall for these reasons.

The Chairman: The meeting is now open for general discussion. We will be pleased to hear from anyone who has any experiences to relate or remarks to make.

W. H. Seaver: There were some remarks made about rail bonds. I do not pretend to be an engineer, and I am willing to confess in the beginning that although there are many varieties of rail bonds we have not a good one yet. There are so many difficulties to be overcome. The first one is the question of installing. There are many kinds which, if properly installed, would be effective; but the customary way is to take a gang of dagoes and put them to work, and a properly made rail bond will be installed with poor results, and they expect a dollar-and-a-half man to do it. I happened to be in Columbus, Ohio, in the street railway business two or three years ago, and I walked along the street and I saw some track up. They were putting in some bonds. They had a drill, and they used oil, and they carefully left the oil there—a nice insulator between the terminals of the bond and the rails; and the muscle required in screwing up the compressor was a little bit more than the workmen cared for, and as soon as they had a nice rivet head they stopped. It was enough to discourage anybody. I was there to talk the advantages of rail bonds.

The particular advantage of rail bonds mechanically is to make them last as long as the rail. Certain joints get more expansion than others. This particular bond after a little while, unless carefully made, lets go, and the electrical efficiency goes with the mechanical break. Then, too, the great difficulty they have in making them effective, is in getting contact that will last. A single terminal bond is the most popular of any, and if properly installed with a rigid joint is very effective. Some people prefer other types. At any rate, the main point is to have a bond that will last as long as possible, and remain effective both electrically and mechanically. That has a practical bearing on the power station. I am very much surprised to see that some modern railway systems in the vicinity of California are using old trolley wires. They have the double contact service. They think it is satisfactory. They put in four or five feet of the copper trolley wire, and they could buy the very best and most up-to-date bond for the same price if they chose to do it.

Still the whole problem is one that is purely a matter of individual opinion. You can travel over the country, and talk with railroad engineers, as I have done, in various places, and find no two of them have the same idea. The result is, it puts us to a great deal of expense in trying to introduce new styles of bond all the time to meet these ideas. There is not one in the whole lot that is any good at all unless properly installed. That is one thing that will never be overcome until the engineers who have charge of the work realize it requires a skilled mechanic to put on a rail bond.

The Chairman: Talking about rail bonding, I think we would like to hear from Mr. Babcock on the subject.

A. H. Babcock: Mr. Seaver's remark that a skilled mechanic, and not an ordinary dollar-and-a-half dago, is required to put on bonds, is only partially correct. I am now installing bonds manufactured by Mr. Seaver's company, with one good foreman in charge of the crew and very ordinary dollar-and-a-half laborers. As far as our inspection can show, the bonds are being installed properly.

It seems to me that Mr. Seaver has gone out of his way to rap the engineer on this business when he says that the great multiplicity in type of bond is due usually to the individual peculiarities of the engineer. It has been my experience that whenever a member of the "Big Four" combination on bonds gets out a new bond, the other three proceed at once, first to run it down, and then to copy it as closely as possible. Apparently this is one of the necessities of the selling end of the organization. This combination is now engaged in imitating the bond of a rank outsider, obviously forced into it by competition.

My experience as an engineer who purchases bonds, indicates that the bond manufacturer, in common with all other electrical manufacturers, is continually tempting the engineer to make some change in his standard methods, in the hope of getting away from a rival manufacturer the business of the engineer's client.

As regards some of the expressions with reference to some of the telephone cables and water-pipes, it does not seem to me that the two are comparable at all in their action in the soil, for the reason that the telephone cable usually is at least partially insulated from the soil by the duct in which it is installed, that it has a continuous sheath, and that it can be reached periodically at the manholes for connection to other underground structures wherever the tests indicate it is proper such should be installed. On the other hand, the pipe is discontinuous electrically and is embedded directly in all kinds of soil. Experience has shown that a great deal of the damage to pipes which is said to have been caused by leakage from electric tracks, is really a corrosion of the pipes of quite another kind, in which the electrical effects are secondary rather than primary. For example: Some years ago it was reported to me that the water main at the Alvarado pumping station of the Oakland Water Company, fully twenty miles from the nearest electric railway line, was being eaten up by electrolysis. My first thought was that it was impossible that electricity could be in that pipe, but since a thirty-six-inch main under ninety pounds pressure was leaking and was showing characteristic pitting, a careful test was made with a voltmeter, with a result that there was found a very considerable potential difference to ground, quite enough to indicate that the pipe was in serious jeopardy. It was discovered very quickly that this potential difference was variable, also that the entire piping structure of the plant was showing potential differences to ground, of different polarities, all of which were varying periodically, and that the cycles did not seem to relate to the time of day, or to the tides, or to other natural phenomena. After a long and careful search, it was discovered that an immense primary battery was in action, the electrodes consisting of the iron pipe drains which were run out from the fire room to the slough nearby, the unconsumed carbon in a lot of ashes that had been dumped from the fire room around the pipes in order to make solid ground in the marsh, and that the electroylte was the salt water of the slough which had soaked into the ashes. The obvious remedy was to remove these pipes from contact with the ashes. Redwood boxes were built, the pipes were enclosed, the potential differences dropped practically to zero, and the cause of the trouble was removed.

This whole subject is one of immediate interest on account of the fact that the approaching electrification of the Alameda Mole lines will bring into action another distribution of electric ground potential differences. The problem seems to be a simple one where the track is supported in rock ballast and consequently is not directly in contact with the soil. But in the city streets where the rails are buried in the street pavement, where water is used for sprinkling (often salt water), the problem is not so simple. Mr. McMeen's suggestion that the officials of the companies interested shall work in conjunction and in harmony to study the situation thoroughly and to agree on the proper engineering remedies, seems to me to be a very practical solution.

Of course, it goes without saying, that the railroad companies must install a proper bonding system, that the track returns should not be directly in contact with the soil, and that as far as possible these negative track connections should be made at points not immediately at the power houses. These statements are fundamental and are almost truisms, but they are often overlooked in practical engineering.

The Chairman: There is one phase of this electrolysis problem that I know of no one to call on. If there is anyone present who can give us any information we shall be pleased to have it,

and that is the legal side of the question. It makes a very pretty legal problem, and I am wondering if there is anyone present who can give us some remarks concerning the legal side of the problem.

A. H. Babcock: In connection with a former electrification, the question was asked of the corporation attorney as to the liability of the corporation, assuming that in making the installation the very best means known at that time had been used, and that new remedies were applied as rapidly as they were developed. The reply was, that the corporation would not thereby be relieved from responsibility for damage caused by it. That to have done the very best possible work was merely an indication of good faith, and might help out with a jury in fixing damages, but it would not relieve the company from liability. It seems to me that this is an extreme view, but it was the opinion of a very accomplished corporation attorney.

The Chairman: I have never seen any definite opinion on it in the courts. I think it has been considered by most of the interests involved that the proper thing to do was as suggested by Mr. McMeen, that the interests involved—the engineers, in other words—settle the problem rather than the lawyers, and where that has been done a satisfactory solution has usually been reached.

S. G. McMeen: Decisions in the Supreme Court of Ohio have given certain standing to the single trolley traction system. For example, that the fundamentally proper use of the highway is for traffic; and that other uses of it, whether upon, above or below its surface, are secondary ones. With such logic, it was held that the interests of the street railway systems were to be regarded more highly than those of the telephone companies and the burden of change lay upon the latter, even in cases where a means of relief by a change in the traction system was plainly evident.

A desire to avoid litigation so far has prevented the getting of many decisions which by now might amount to law. A sufficiently comprehensive negative feeder system, however, is desirable enough to make such litigation worth while in many cases, if the results may not be had in another way.

The following references contain some useful features bearing on the relations in question: Cumberland Tel. & Tel. Co. v. Ry. Co., 93 Tenn., 492; 4 Am. Elec. Cas., 297; 29. S. W., 104. Hudson R. Tel. Co. v. Watervliet & R. Co., 135 N. Y., 394, 642; 32 N. E., 148; 31 A. S. R., 838. 4 Am. Elec. Cas., 275. In England: National Tel. Co. v. Baker (1893), L. R. 2 Ch. Div., 186; O Am. Elec. Cas., 327.

A. H. Babcock: May I ask Mr. Vincent a question? In his discussion I understood him to say that it was necessary in making a survey, to measure the quantity of electricity in the pipe, that is to say, the flow in the pipe itself. It seems to me that such measurements must be extremely difficult to make with any accuracy, and, therefore, that conclusions based upon such measurements are liable to serious error. It would be interesting to know how those measurements were made, and whether the differences in current flow in closely adjoining sections of the same pipe could be determined with sufficient accuracy to give a measure of the leakage from the pipe to the ground, and hence a measure of the damage done to these sections.

W. J. Vincent: In measuring the current in the pipes I had in mind the reasons for that. One reason is that it often helps in tying down the exact source. For instance, if you plot your current in your pipe, and you can tie it down to the load curve of a power station as evidence that it is due to the particular traction system, it would nearly always coincide with the load on the power plant. Take, for instance, as you say, a pipe for a couple of blocks and measure the current on either side of a street railroad crossing, you will find out whether your current is leaving your pipe under that track and going back to the power house, or vice versa; whether corrosion is taking place, so take a long line of pipe, and you can locate then if the current is leaving it in those particular crossings or not. That was what I had in mind by measuring the current in the pipe. I also had in mind this: Mr. McMeen brought up the question of Ohm's law. Taking potential differences at a number of points of metallic pipe structures and the rail, and at the same time measuring the resistance of those points with an ohmmeter, and calculating the current by Ohm's law, and it is perfectly evident you get possibly as many times the actual current flowing as the measures you take; but there actually have been reports made and seriously considered on that basis.

There is another point you speak of, and that is, in making an electrolysis survey, take for instance the gas or water pipe system, and taking the potential differences between those particular systems you are investigating, and the rails, and you may find it entirely negative to the track, which would at first glance appear that there was no electrolysis taking place, no current leaving the structure. On the other hand the current may be flowing to another structure, such as a water pipe of another company, and then back to your own pipes, getting in and out without any damage to the rail, and causing electrolytic corrosion in those places, whereas your own structure that you are investigating is entirely negative at all points. I had a case where a pipe was being eaten up by corrosion with a negative to the rails at all times, and an investigation showed there was an oil pipe near by.

A. H. Babcock: Perhaps I did not make my meaning clear. In making such studies I have always used a voltmeter, and by the polarity and magnitude of the readings, determined the condition of the pipe with reference to possible damage. I have not made such measurements for a good many years, and when an ammeter was mentioned, it occurred to me that possibly a new method of testing pipes might have been developed recently. If so, I would like to get up-to-date. Therefore, I asked the question whether the current measurements in the pipe were of such a nature that an accurate determination could be made as to the quantity leaving the pipe at a given point, and consequently the damage being done at that point. It seems to me that this point should be clear, namely, that the voltmeter gives merely qualitative determinations, while an accurate measure of the current flow at different sections in the pipe would give quantitative results. In the case of a mixed system, for example, gas-pipes, water-pipes, telephone cables and tracks all in the same general locality and all showing different potential differences to the rails, it is easy to see that there is an exchange occurring between the different pipes. If the current flows within these pipes could be measured, it would be very much more simple to predict the results and to apply proper remedies. For these reasons, it seems to me that this point as to the measurements of current in the pipe itself, should be thoroughly cleared up, and that if there is any superiority in the use of the ammeter rather than the voltmeter, it should be set forth clearly.

W. J. Vincent: In making tests of that kind I did not have in mind using an ammeter. The method was this: Take the pipe on either side of the crossing, in taking the pipe on either side of the rail, and exposing it for a certain length, say between the joints, you can get the resistance of the pipe pretty accurately by experiment or prepared tables of the amount of metal in the pipe, and with the meter you can get current in the pipe, and take simultaneous readings, and if they coincide there is no current leaving under that pipe. You have to use exactly the same type of instrument and same size, and take absolutely simultaneous readings.

A Member: Wouldn't the corrosion of your pipes throw out your measurements considerably?

W. J. Vincent: No, the current is flowing in the pipe on either side of your crossing.

S. J. Lisberger: Isn't the question of the resistance of the pipe a very indeterminative quantity? I recall some tests made some time ago which showed that the resistance of various metals, notably steel and iron, would vary greatly with the stresses put upon the metal. Mr. Hambuchen of the University of Wisconsin made tests of this kind. He took a boiler plate, and subjected it to all sorts of tests from the blow of a hammer to the elastic

limit of the metal; he found great variance in the resistance of the same kind of plate due to the stresses imposed. I should think that the method of calculating resistance from the cross section of the pipe very inaccurate.

A Member: I should like to ask Mr. Vincent if he made any measurements of the resistance of cast lead joints in pipes; if the conditions are materially different?

W. J. Vincent: I have not. They are materially different.

Elam Miller: If I understood Mr. Babcock's first remarks, they seemed to imply that it was not a desirable thing to have a danger area near the power station, and for that reason he suggested the extension of negative feeders. That may be a fact with respect to the water pipes; but I know, as far as telephone companies are concerned, it is a simple thing to have the danger area limited, and we don't care particularly what the potential differences are within that danger area, speaking comparatively; but it would be better to have it limited in size rather than extended far out, because it is a comparatively simple matter to lead the return current back to the negative post irrespective of the amount.

A. H. Babcock: I think I can see the reason for this preference on the part of the telephone companies. As I stated a moment ago, they are dealing with continuous conductors at least partially insulated in ducts, and readily accessible at points only a short distance apart, at which points measurements can be made and contacts can be applied wherever this remedy is suggested. Between contacts there is practically no loss of current due to bad joints or to heavy leakage. Consequently the damage is small. But, on the other hand, a pipe system has electrically bad joints, it is laid directly within the soil, and is not readily accessible for measuring purposes. Consequently, if the danger area is concentrated, and the potential differences are high within such area, a very serious damage may be caused before any danger is indicated. Whereas, if you spread the danger area out, the actual potential differences to ground are reduced, and the area over which the current can leak to ground is very materially increased.

It is my understanding that the policy of companies owning pipes in the ground is to adopt the latter method of handling the difficulty rather than the former, and it would seem that both the telephone companies, and the water and gas companies are equally correct, each from its own standpoint.

Elam Miller: If it were desirable to scatter the danger area out you could do that very readily by putting a negative booster to the trolley. We have had cases of that sort, and have gone at it with the view of having the potential of the machine reversed with respect to the trolley and track, because that is exactly what it does; it scatters the danger area over quite a space. It limits the current in any one point, but it makes it infinitely more difficult to prevent all.

A. H. Babcock: The reversal of polarity, of course, was tried very soon after railroads began to cause damage to the pipe systems, but this scattered the danger zone over such a tremendous area that it was out of all control. It is easy to see that if all of the connections from the rails to the negative bus bar of a large power house are made within a short distance, say within one block of the plant, the pipes will be delivering to the tracks a very large amount of current within a very short distance, and ordinary remedies, such as heavy bonding between pipes and rails at these points, will not afford sufficient protection. But, if negative feeders are run out two or three blocks in all directions and are there connected with the tracks, the load formerly concentrated within the pipes in a small area will now be scattered out through a larger area of ground and consequently through more pipe metal. It is obvious that the leakage of current in the latter case will be less than in the former.

The Chairman: It is a very interesting question. I think it would be well for us to have further discussion on this.

L. E. Reynolds: I had some experience with the Los Angeles Railway Company about four years ago, which might be interesting to some of you. We were working on that same theory, that it was better to concentrate the troubles and take care of them, so we adopted the same scheme that Edison did many years ago with the three-wire system. It was rather a complicated case to work out, in having part of your trolleys positive and part negative because of trolley crossings and the necessity for insulation, and we thought we were going to have a lot of trouble when it rained. After it had been running for some little time I was very much surprised to find that a certain piece of oak wood which we had used with trolley insulators (which was a home-made affair) had sustained a potential of a thousand volts across that in a rainstorm for several nights. There was no trouble from it at all; so we fitted up one of the sections out in West Los Angeles, where the traffic is rather heavy, and operated for several months on one of the machines with this negative to ground, and made several readings out in that section, both with the positive to trolley and the negative to the trolley, and we found the condition to be considerably better. It acted the same as reducing the return current; in fact the current did not come back on the rails at all; it came through the other trolley; it went out on one trolley, through two sets of cars, and back to the other.

Another case that Mr. Miller brought out may be interesting here. In 1899 and 1901 I had charge of the installation of the underground system of the Independent Company in San Francisco, which was a case almost identical with the telephone conditions. We had lead covered cables in the underground section of the city operating from four different substations downtown. The United Railroads—the Market Street Railway at that time—were operating from an out-of-town station—not the substation they have now, and we found the danger point downtown where the traffic was greatest. In order to make that connection as good as possible, or even better, we confined it to almost no area at all; in fact we brought it down so there was no danger point at all by installing electrolytic machines, possibly maintaining ten volts and one to two thousand amperes, and lowering the tension on our cables below the rail at all times by furnishing a path from the machines, which is the same as a booster. This was operated until it was burned in April, 1906. I was familiar with the underground conditions at that time, but I don't know what you have in the city since then. The cables were very well protected. We had no troubles that we could locate from electrolysis in the downtown section where these boosters were operated. We had troubles in the Potrero district where there was a salt water main across our conduit line.

Another source of trouble handled with these boosters was along the old Eighteenth street car line, Sixteenth and Seventeenth street, where the soil is filled in. A lot of it is the dump from the crematory, and possibly the soil has a lot of microbes. That section was traversed by our power line between the generating station and downtown substations. Another case is where we tried to compete at that time with the San Francisco Gas and Electric Company for elevator business; and we installed a 220-volt, two-wire system, to handle elevators in the vicinity. To carry that current back we had the negative grounded and carried in lead-covered cables. We found that the trouble caused in rainstorms due to leakage through the weather proofing was considerably greater than the United Railroads currents, and that made it necessary for us to connect up the regular three-wire machines, and carry the current back in a negative lead-covered cable.

A. J. Pahl: I have had some experience with a simple system, operating principally in the downtown districts, and in the neighborhood of ten or fifteen power cables feeding from a substation. We have a small negative booster installed, about 300 amperes, running about five volts. (To keep the cables negative we raise them about six or eight blocks from the station.) On McAllister and Market the cables have a tendency to become positive. When the United Railroads reconstructed their lines this trouble has been done away with. That is, our cables are

entirely negative all over the system. We have also had some trouble. We found that the United Railroads returns caused us trouble. We have been operating in the neighborhood of a year now, and have hardly any troubles from electrolysis from the railroad returns.

S. G. McMeen: With regard to damage to reinforced concrete by electrolysis, has it been determined that the base of any modern building actually does serve as a conducting medium between points having such diffeernces of potential so that current passes through or from the metallic structures *in a known amount?* If there is data on that question, it would be of value to be known to us and others. The only reason for doubt, if any of us have doubt, is that we know such buildings to be of relatively small ground area and so to bridge between points a limited distance apart. Even imagining a number of adjacent buildings to form one conducting structure in the ground, we still think of the extreme conductor-length as very much less than the parts of an underground pipe system. In other words: Does a building of a fairly imaginable size cover area enough, to have a dimension in the earth long enough, to enable it to meet potential differences great enough, to carry, as a result, current enough, to corrode its structure enough to be a seriously endangering cause within the otherwise natural life of that structure? I do not know. My only positive emotion on the subject is that whereas with reference to underground pipes we have much knowledge and little agitation; concerning the discussed phase of damage to building construction we have little knowledge and much agitation.

A. H. Babcock: It is my recollection that the paper referred to was by Mr. Knutzen and was published in the Institute proceedings some years ago. The author showed that the current from the surface tracks in Brooklyn was returned to the power house by way of the Brooklyn Bridge cables to New York, thence by the streets through the pipes, etc., to the point where the cables to the Brooklyn Navy Yard leave the New York shore, and thence through these cables to the power house. A good deal of alarming talk was started at this time as the result of this experiment, but about this time the bridge began to show signs of real failure in some of its floor members, and the possibilities of electric damage did not receive so much public attention.

S. J. Lisberger: Mr. Bowie raised a mechanical question a little while ago; and since this subject has been discussed it would be of interest to hear from Mr. Bowie about the difference of electrolytic action on cast iron pipe and steel pipe. I remember he told me he made some investigations on that subject.

A. J. Bowie: Cast iron pipe undoubtedly has a far higher resistance than wrought iron pipe would have. There is another matter in connection with electrolysis in which I am also interested, and that is the telephone end. Fibre conduits, it is claimed, have high insulating efficiency, and it is also claimed that they exercise an important function in preventing electrolysis in cables. It is not within the province of telephone work, as I am aware, to attempt to rely on such insulation, for the reason that telephone cables are exposed to contact to ground in numerous other places, such as in damp manholes, where they come in contact with the sides and terminals of the cables. I should like to inquire whether any systematic attempt has ever been made to insulate entirely the telephone system, or whether such an attempt in the case of telephones would be impracticable in view of the extensive nature of the system. It would appear to me it might be possible if suitable insulation were used, and the system were not too complicated to install insulating hangers in the manholes.

The Chairman: I might say, Mr. Bowie, that I personally have never heard of any attempt at such a thing. The ordinary telephone cable telephone system has so many ramifications, the cable goes to so many places, they have to be installed under so many various conditions, that as a general thing such precautions as insulating a cable, or the precaution of insulating the cable sheath, is rarely if ever practical. Occasionally in my experience we have found it advantageous to install insulating joints in cables. I remember one case where we were compelled to do that, where we had a cable suspended from a bridge, and on this bridge was a trolley system, the rails of which did make contact with the bridge framework, or rather we made contact. There was contact made in the first installment between the cable and the steel work of the bridge, and while we destroyed one cable entirely, we remedied this by putting an insulating joint in the cable at both ends of the bridge. That was not really on account of electrolysis, however.

B. C. Shipman: Some fifteen years ago the district commissioners of Washington, D. C., agitated the electrolysis question. I had charge of their electric survey to find what the trouble was. As a result we did not find much damage to the pipes. A few services were eaten, all near the power house; but the greatest point brought out at the time was, what was beneficial to the telephone companies was not beneficial to the water companies. The question of negative boosting was also brought up at that time; but it makes the matter worse with the water mains, as it induced the current to take the water mains. They took to the double trolley there, and they have had no trouble with electrolysis since. In our experiments we came across much wider differences of potential than spoken of here.

Another case we ran across that was rather successfully turned was a big 48-inch main that came down from the reservoir; and in making our tests along the track we found a drop in one direction, and about a quarter of a mile further on we found it in the other direction, which was a peculiar fact as there was no power house in the vicinity, and by going back we located where the trouble was. We went to the car house. The foreman was very obliging, and he said, there, that was the way they carried the current back, and he showed us where they tapped it, and it made a nice return service.

The Chairman: One question has not been answered. It was asked whether the matter of alternating current electrolysis had been discussed. This matter was mentioned in Mr. Miller's paper briefly, and there isn't anything in that subject today except what has been already printed in the proceedings of the Institute. In that connection I might say I remember the time the alternating current was first proposed for railway work, all telephone engineers were very greatly disturbed as to what was going to happen. They knew it was perfectly feasible to equalize the potential, or to make the cables negative by bonding, and that was very well understood, but when they thought of alternating currents being turned loose, not knowing what it might do, everyone was greatly perturbed. Mr. Foley thought, with many telephone engineers, it would be absolutely impossible to work an alternating current system and the telephone system in the same vicinity. However, the experiments made, and papers that are in the Institute transactions have data and tests to the effect, that there is nothing serious to fear from alternating current tractions as far as the electrolysis action on lead-covered cables is concerned, especially those used in telephone work.

A Member: Mr. Bowie brought up the matter of the use of an insulated duct as the fibre duct. I think the answer to that whole thing is, it is more expensive. It would be more expensive to attempt to insulate the system than the means used at the present time for overcoming electrolytic trouble. It would be very difficult to insulate the underground telephone system.

A. J. Bowie: Where we found any particular benefit was in the particular duct itself, on account of the conductivity of the duct carrying the current out of the lead cable, and whether the fibre duct would not avoid such trouble.

Elam Miller: Most of the causes of electrolysis that do occur do not occur between sections, that is between manholes within the section itself. At one time it was the practice to measure throughout the duct, but I think it is almost useless. There are very few cases of that sort. It is nearly all in the manhole.

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Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday for the paper dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

FOUNDED 1907 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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Electricity in Mining

Electricity owes much to mining. Without iron's magnetism, copper's conductivity, coal's heat and gold's assistance, amber and rubber might yet be the chief sources of electric energy. From the miner we get tungsten and tantalum for the metallic fillament lamp; platinum for the carbon fillament; mica, asbestos and clay for insulation; zinc and lead for batteries; quicksilver for the mercury arc; aluminum; titanium; and slate and marble for switchboards, produets whose peculiar properties make them invaluable to the electrician.

Recently, however, electricity has come to the aid of mining and is repaying with interest its debt of service. The electric motor and the electric metallurgist, by lowering the cost and raising the output, have made available deposits hitherto unworkable. Electricity so greatly facilitates every method of winning and extracting mineral that a knowledge of its principles is as essential to the mining engineer as is an understanding of geology.

Electric power, because of its convenience and economy, its flexibility and efficiency, its capability of transmission and its universality of application, is superseding steam, hydraulic and compressed air power, which long have vied for supremacy in mining work. Electric underground haulage takes the ore from the face more expeditiously and more cheaply than any system of men or mules yet devised. With the advent of efficient means of controlling the speed of alternating current motors, electric hoisting is coming more and more into use. Electric driven pumps, either plunger or centrifugal, are simpler and more reliable than others. Electric ventilators and electric rock drills, while giving satisfaction in some cases, have not yet displaced the two-fold advantage of the compressed air drill, though many compressors are now electric-driven. The electric telephone is proving invaluable as a time saver, and the electric light has become almost indispensable.

Leaving the mine and going to the mill, we find that motor-drive of conveyors, crushers and concentrators is finding an ever increasing application. The tendency here, as elsewhere, is toward the simplification made possible by individual drive, which eliminates noisy and dangerous shafting and belting. Magnetic and electro-static separators have solved some difficult problems in milling and there is today scarcely a metal which is not commercially reduced by some electro-chemical or electro-thermal process. Of these electrolytic copper and aluminum are prominent examples.

Consequently the debt is mutual, neither can now be given precedence over the other, but each in its advance has acted and reacted favorably upon the other.

CURRENT COMMENT

Mail handling by electric vehicle has been substituted for horse-drawn vehicles in New York City.

Electrification of Japanese railroads is under consideration and it will be but a short time before all branch lines will be electrically operated.

Electric driven revolving doors at the entrance to office buildings and hotels are being installed so that they can be controlled by special attendants.

An electric lawn-mower equipped with a half-horse-power electric motor is on exhibition in Chicago. Current to operate 36-inch cutting blades is supplied through a flexible cable.

The deepest producing oil well is believed to be a 4350-foot well near Los Alamos, California, in the extension of the Santa Maria field. Its drilling required two years and it has yielded 600 barrels a day.

Secrecy in wireless telegraphy is said to have been attained in experiments conducted by R. H. Armstrong and H. H. Thomas of the United Wireless Telegraph Company between Seattle and Aberdeen, Washington.

Electric glass cutting, which consists in passing an electric current through a piece of resistance wire wound tightly around the bottle or other glass article, gives a clean true fracture in any desired direction. The glass should be dry and a short scratch made on it by a file, the wire passing over this file mark.

The Lemoine case of fraudulent diamond making came to an end in Paris this month with a sentence of six years' imprisonment, a fine of 3000 francs and five years' banishment for the accused who obtained much money from Sir Julius Wernher and others by representing that he had discovered a method for making diamonds.

An electric clock, self-contained and operated by a dry battery has been invented by a Mr. Kutaw of London, The balance wheel is controlled by an isochronous spring to which an impulse is given every three seconds by an electro magnet on the wheel, thus dispensing with spring and pendlum and giving noiseless operation.

American Exposition in Berlin 1910 is announced for April, May and June of that year and is intended to educate the German people to the importance and excellence of American manufactured products, thus strengthening existing cordial relations and stimulating trade between the two countries. American headquarters are maintained at 50 Church street, New York City.

Electrolytic iron is made by placing cast-iron or even iron ore in an acid bath and connecting to the positive pole of a dynamo. The iron is deposited upon the negative pole, which may be in the form of a lead-covered wooden core or plate to make pipe or sheet iron respectively. This electrolytic iron is said to be of better quality and the tubes and plates rust less than those made by melting and rolling.

Loss of Russian telephone trade, because of inattention, is cited by Consul John H. Grout of Odessa in the case of this city's telephone management which some time ago sent an order to a certain manufacturing firm in the United States for a lot of instruments. The goods were desired at once in order to meet almost immediate demands. Delay succeeded delay in receiving the goods, and it was six months before they arrived, during which time the management was obliged to order from Germany supplies sufficient to provide the most pressing demands. Owing to this lack of attention on the part of the American firm, the local company has decided henceforth to order its supplies from Berlin and of German make. Perhaps this incident may serve as a reminder to American houses desiring foreign trade that if they wish to keep or gain it they should be prompt in filling orders.

Government irrigation projects covering approximately 510,000 acres of land, of a value of $100,000,000, in Yakima, Kittitas, and Benton Counties, in Central Washington, are held in abeyance as the result of an order by Richard A. Ballinger, Secretary of the Interior, putting an end to the co-operative plan of building government plants to supply moisture to semi-arid and arid lands. According to the ruling no new projects shall be undertaken, nor any unit of a project begun until all the money necessary for its completion is available in the reclamation fund. There are three important projects in the Yakima Valley—the Wapato, 120,000 acres; Sunnyside, 90,000, and the Tieton, 30,000 acres. The proposed high line ditch in Kittitas County calls for the reclamation of 60,000 acres, while the Benton County project would add 210,000 acres of waste land to the wealth producing area of the State of Washington.

Electrical engineers in Argentine Republic have established a high standard in the installation of tramways, city lighting plants, telephones, etc. Installations of the higher order of engineering, such as first-class elevators, motors in modern offices and hotels, etc., are in their infancy. There is a good opening for first-class electrical engineers, as well as structural engineers, and they will be successful if they conform with the customs of the country to a certain extent, but they must remember that electrical and other engineers in Argentina are paid fully 20 per cent less than the usual pay of engineers in New York. The principal difficulty to be encountered by American engineers is that construction is financed by English, German, or French capital, and naturally the important posts fall to the engineers of the countries furnishing the capital. This does not mean that there is no room for American engineers, whose training and methods of work are acknowledged to be the best in the world.

PERSONALS.

L. B. Cramer has succeeded H. Milliken as electrical engineer of the Oregon Electric Company at Portland.

W. L. Goodwin of the Sterling Electric Company, San Francisco, spent the past week in recreation at Los Angeles.

Wm. Swart of the Demerest Company, of San Francisco, has returned from a two weeks' trip to Denver and Salt Lake City.

C. W. Vaughan of the Geo. E. Witt Company, manufacturers of oil burning appliances, has returned from an extended eastern trip which included Chicago and New York.

John R. Cole of the John R. Cole Company, San Francisco, left for the East July 25th by way of Portland and Seattle; he will spend a few days in the Northwest and his entire trip will cover a period of about six weeks.

R. G. Rice who has for some time been in charge of the electrical construction work of the Thompson-Starrett Company, building contractors at San Francisco, has left for New York City, where he will fill a similar position with the same company.

W. M. Deming, with the Schenectady office of the General Electric Company, has spent the past week or ten days upon the Coast, including Los Angeles and San Francisco in his visit. He will depart for the Northwest some time next week, his trip to include a brief visit to the Alaska-Yukon-Pacific Exposition at Seattle.

R. E. Heine, who has been connected with the San Francisco office of D. H. Burnham & Company as electrical engineer, has discontinued his work in the above position and is now on a southern trip in search of rest and pleasure. His present plans contemplate his return to Chicago at the conclusion of his present trip, to take up the same character of work with the above company at that point.

Albert J. Steiss, former assistant general manager of the old Pacific States Telephone & Telegraph Company under John I. Sabin, general manager, and later under Louis Glass, who succeeded Mr. Sabin, died July 24th at Nauhein, Germany. Mr. Steiss had been in ill health for several years and his visit to Germany was with the object of securing the relief which appeared impossible in this country.

F. B. Gleason, manager of the Dallas, Texas, house of the Western Electric Company is due in San Francisco on August 4, to succeed P. H. Coolidge, who severed his connection with the Western Electric Company to become associated with the Pacific Telephone & Telegraph Company as assistant general manager. Mr. Gleason in taking up this work will not only handle the management of the San Francisco house but as district supervisor will direct the work of the company at Seattle, Los Angeles and Salt Lake City.

W. E. Elliott of San Francisco has been elected treasurer of the newly organized Pacific States Electric Company. Mr. Elliott will be well remembered through his connection with the old California Electrical Works of San Francisco, having been associated with that company as secretary and treasurer from 1899 to 1905, in which year he resigned from that organization to enter the lumber business. His experience in the electrical supply business has been a broad one and he will undoubtedly add strength to the new organization.

Visitors at the headquarters of the Northwest Electric Light and Power Association at the A. Y. P. Exposition for the week ending July 10th, were: Arthur Gunn, Wenatchee, Wash., Wenatchee Electric Company; S. C. Lindsey, Seattle, Wash., Seattle Electric Company; A. S. Moody, Seattle, Wash., General Electric Company; W. W. White, Seattle, Wash., Seattle Chamber of Commerce; O. C. Lacey, Seattle, Wash., Great Northern Steamship Co.; Alfred Watson, Seattle, Wash., Great Northern Steamship Co.; J. W. Kinkaid, Port Townsend, Wash., Citizen Electric Company; Allen E. Ransom, Seattle, Wash., Westinghouse Mfg. Company; E. F. Benson, Prosser, Wash., Prosser Power Co.; Sidney S. Kearns, Toronto, Canada; R. C. Taylor, Portland, Ore., Portland Ry. Light and Power Co.; A. K. Marriott, Seattle, Wash., Columbia River Milling Co.; Thos. F. Jack, Seattle, Wash., Westinghouse Mfg. Co.; E. G. Robinson Jr., Arlington, Wash., Jim Creek Water, Light and Power Co.; Antonie G. Labbe, Portland, Ore., Willamette Iron & Steel Works; H. B. Allen, Mexico City, D. F., Westinghouse Electric Mfg. Co.; C. V. Allen, Mexico City, D. F., Westinghouse Electric Mfg. Co.; Fred D. Weber Portland, Ore., A. I. E. E.; O. Lewis, Snohomish, Wash., Snohomish Light, Water & Power Co.; E. P. Sinclair Jr., Ruthford, N. J., S. Steinam & Co.; C. A. Stewart, Seattle, Wash., Kilbourn & Clark Co.; Fred Huntsman, Grand Junction, Colo., Grand Junction Gas & Electric Co.; Lillian M. Marr, Wenatchee, Wash., Wenatchee Electric Co.

LOS ANGELES SECTION AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Los Angeles Section of the American Institute of Electrical Engineers closed the year's work with a banquet at the Hollenbeck Hotel on Thursday evening, the 8th inst. Arthur Ballard acted as toastmaster and more than lived up to his reputation for keeping "something doing every minute."

Mr. Koiner, the retiring Chairman, gave a very concise report of the annual convention at Frontenac. He stated that there was a possibility of bringing the next convention to the Pacific Coast, possibly to Los Angeles. A committee is to be appointed to understake a campaign for this purpose.

The Secretary announced the election of an Executive Committee as follows: V. L. Benedict, C. W. Koiner, J. A. Lighthipe, J. E. Macdonald, E. R. Northmore, E. F. Scattergood and Ed Woodbury. From these the following offficers were elected: Chairman, J. A. Lighthipe; Secretary, J. E. Macdonald; Assistant Secretary, Ed Woodbury.

Jim Lighthipe, the newly elected Chairman, has made himself absolutely essential to the section during his year's sojourn in the south. He modestly thanked the members for their good will, and gave his views on what it is hoped to accomplish during the coming year. Among the other speakers of the evening were Mr. Barry Bibble of St. Paul, who commented on the proposed three-fold classification of membership in the institute; also I. T. Dyer, the recently elected Vice-President of the Telegraph Superintendents' Association of North America. I. T. told about winning next year's convention of his society for Los Angeles. He also told some pleasing stories gathered on his recent Eastern trip.

R. H. Manahan, who has also just returned from an extended Eastern tour, broke loose in Swedish dialect, giving his experiences at the Minnesota State House. As the section's Swedish reporter, Walter Fagan, was absent, it was impossible to get a complete report of these remarks.

Deacon Pyle, being called upon, proved that he was no deacon at all, and gave his views on "Woman's Suffrage" and the "Philosophy of Life."

Mr. Plye's remarks were very pessimistic, and it was therefore considered inadvisable to give publicity to such unorthodox ideas. F. H. Burger sang "Dio Possente," from "Faust," which was one of the most pleasing items on the program. A quartet comprised of Messrs. Morris, Currier, Green and Lewis discoursed "Bible Tales" to new and varied paraphrases of V. L. Benedict's concoction. Mr. Benedict also helped R. H. Manahan sing an Irish song which the toastmaster cruelly characterized as the worst effort of the evening.

The evening's entertainment closed with a lantern slide exhibition of samples from Ira Francis' art collection.

JOURNAL PORTRAITS

F. H. POSS, in charge of the Pacific Coast interests of the Holophane Company, New York, and the Benjamin Electric Manufacturing Company, Chicago, is a native of Indiana and was born at Indianapolis. During his childhood his parents located at St. Louis, Mo., where he received his education and for some years made his home.

His first experience in the electrical business was acquired with the Wagner Electric Manufacturing Company at St. Louis, but his engagement with them was a brief one and was followed by a financial experience with the Jefferson Bank of the same city.

His first experience led him to again take up electrical work and following his banking experience he joined the sales staff of the Holophane Company at their St. Louis office during the period of the Louisiana Purchase Exposition in 1904.

His success in this work led to his selection as manager

F. H. Poss.

of their Pacific Coast business, a position he accepted in the early months of 1905 and the first office of the Holophane Company on the Pacific Coast was opened by him in the Crossley Building, at San Francisco, at that time.

In connection with the management of the Holophane Company Mr. Poss also accepted the Pacific Coast agency of the Benjamin Electric Manufacturing Company of Chicago. He made his initial bow upon the coast as representative of both companies.

The offices originally established in the Crossley Building were continued until the great fire of 1906 made new quarters necessary. This was followed by location in temporary quarters at various points until their present offices and warerooms at 151 New Montgomery Street were secured.

Mr. Poss is one of the younger set of the electrical fraternity and an enthusiastic member of the Sons of Jove. He is an untiring worker in the interests of the companies he represents and the important position they now occupy in this territory is to a large extent the result of his energy.

TRADE NOTES.

Joseph Theiben & Co., representing the manufacturers of the Pittsburg Water Heater and the Star Electric Incandescent Lamps, have moved from their former location at 585 Mission street to 667 Mission street, San Francisco.

The United States Electrical Manufacturing Company have moved from 214-16 San Pedro avenue to their new and larger quarters, 459-61 E street, Los Angeles, Cal. The move was rendered necessary by the rapid growth of their motor trade.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., has removed the sales office formerly located at Tuscon, Ariz., to 173 San Francisco street, El Paso, Tex., where it will be continued as a branch of the Los Angeles office.

The offices and display rooms of M. A. Bryte, Pacific Coast representative of the Sterling Electrical Manufacturing Company, Warren, Ohio, manufacturers of Sterling incandescent lamps, have been moved from 718 to 788 Mission street, where they occupy the entire third floor.

Otis & Squires, agents for Dossert & Company of New York, announce that that company is placing on the market an entirely new line of connectors for making secondary connections to transformers. This type of connector, they advise is something entirely new and of great interest to those engaged in transformer work.

The D. & W. Fuse Company, Providence, R. I., who have been known for some years as manufacturers of Deltabeston Magnet Wire, the heat proof and moisture proof wire, insulated with pure asbestos materials, announce that they are now manufacturing Deltabeston coils made of this magnet wire and are in position to execute orders for everything in this line.

The Western Steel Works, a new corporation, entered the business field in San Francisco on July 1, 1909. The officers and incorporators are: A. Haas, president; D. O. Rheinhold, secretary; T. H. Downie, vice-president. The business of the new company is to manufacture crucible steel castings, and the office is located at 313 Howard street. Mr. Haas, the president, has for several years been engaged in the pattern-making business and is well known in the industrial world. The furnaces for the new steel casting plant are now being installed.

AMONG THE CONTRACTORS.

Contractors are now figuring on the electrical work for the new Cuyler Lee Garage.

Specifications are out and estimates are now being made up for the electrical work on the new San Francisco Children's Hospital.

John G. Sutton of the John G. Sutton Company, San Francisco, is now in Portland, Ore., and is planning to leave for the east early next week.

Contract for the electrical work on the new building for the Prager Co., Inc., San Francisco, has been awarded to the San Francisco Electric Company.

Contract for electric wiring in the new Keystone building, San Francisco, has been awarded to the Standard Electric Construction Company of San Francisco and the work is now under way.

The California Electric Construction Company of San Francisco has been awarded the contract for the electric wiring on the new ten-story First National Bank building at San Jose, of which C. B. Dutton is architect and L. A. Hicks contractor. The total cost of the building is $250,000 and the electrical contract will amount to approximately $5,000.

NEWS OF THE STATIONARY ENGINEERS.

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco. Thursday, Central Hall, 124 Fulton St. Pres., A. C. Arbuckle. Sec., Herman Noethig, 900 York St.
No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., Gabriel Allen. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.
No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.
No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.
No. 6. San Jose. Wednesday. Pres., W. S. Pierson. Sec., Leal Davis, 350 N. 9th St.
No. 7. Fresno. Pres., J. F. Wagoner. Sec., F. J. Whitney, Box 8.
No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., Jos. Gieger.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., O. H. Reed.
No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.
No. 3. Walla Walla. 1st and 3d Wednesday, German Hall. Pres., W. M. Quinn. Sec., O. L. Compton, Box 11.
No. 4. Spokane. Tuesday. Pres., Grant Tuttle. Sec., J. Thos. Greeley, 0601½ Cincinnati St.
No. 6. Seattle. Saturday, 1420 2d Ave. Pres., J. H. Beckman. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Engineering Editor.

SAN FRANCISCO NO. 1.

At the meeting of above association held July 22d thirty-one candidates were balloted for and elected. They will be initiated on next Thursday evening, July 29th. The joint State Convention committee will submit its final report, to the members of S. F. No. 1, and California No. 3, in joint session at the same meeting. Brother Ennor, chairman of the educational committee reported that in the near future he will have some very interesting lectures for the benefit of the membership. Bro. J. L. Davis gave an interesting account of his vacation trip to Saratoga in an automobile.

H. W. NOETHIG, Secretary.

CALIFORNIA NO. 3.

The officers of California No. 3 were installed by Past State President H. D. Saville at their last regular meeting. The new president, W. N. Munro, initiated two candidates—W. J. Newby and James B. Castle. Eight more applications are on hand; a number of which applicants will be initiated at the joint meeting of No. 1 and No. 3, on the evening of July 29th, at the rooms of No. 1 in Carpenter's Hall, 124 Fulton street, San Francisco.

The reception committee reported that arrangements are now complete for this affair, which will include a class initiation of candidates to both associations. The general committee of arrangements on convention and mechanics' fair, will submit their final report, after which the members will meet their friends in the banquet hall, where a smoker and talkfest will be held and a jolly good time is promised.

TROUBLESOME FOLLOWER BOLTS AND THEIR CURE.

While on watch one evening in one of the large central stations in the East a dull thump was heard in one of the horizontal high pressure cylinders; no other sound resulted and the engine ran apparently the same as before, but to be certain the engine was cut out the line and shut down.

After a careful outward examination, during which nothing was found, we took off the cylinder head, and the mystery was solved. The piston was of a standard type, with

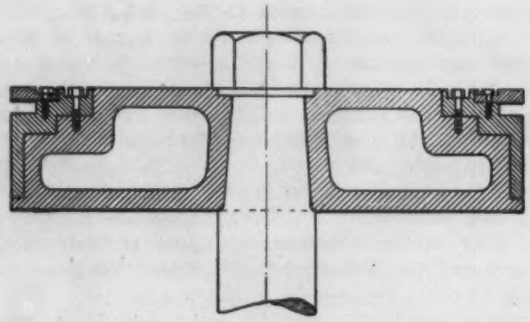


Fig. 1.

piston proper, bullring, steam ring and follower plate, the follower being bolted to the bull ring, which in turn was bolted to the piston (see Fig. 1). One of the follower bolts had broken at the root of the thread, and had fallen to the bottom of the cylinder and the piston smashed it against the head. As the bolt was ⅞-inch in diameter and its head correspondingly larger, the clearance but ⅜-inch, the effect can be surmised. The bolt was flattened and its imprint was left in both piston and cylinder head; that in the head being

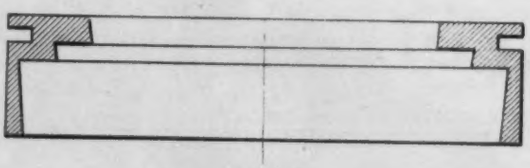


Fig. 2.

¼-inch deep. On further examination it was found that the piston rod, 8 inches in diameter, was bent, but not sufficiently to cause it to scrape the stuffing box, but enough to put it out of commission. As there was a spare rod on hand the bent rod was backed out of the crosshead, the piston removed from it and placed on the new rod, and the whole replaced in the cylinder.

This was the first accident of a series of similar ones. In fact the situation became so serious that it was determined

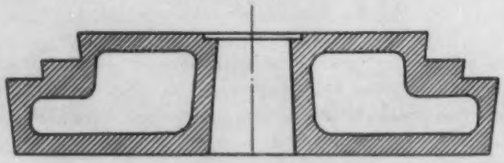


Fig. 3.

to do away with all bolts in the pistons; in other words, to put in solid pistons, and the job was done in the following manner: A number of castings were made, resembling the old bull rings, and were turned off on the inside in the manner shown in Fig. 2. The old pistons were stripped of follower and bull ring and turned off in the manner as shown in Fig. 3; the projections being turned off on a slight angle, the outside diameter being 1-64 larger than the inside diameter of the bull ring.

The piston and new bull ring were taken to the yard, and a fire built around the bull ring which heated it to a dull red, expanding it until it could be slipped over the projections on the piston. The bull ring was then allowed to cool, shrinking on to the piston, forming a perfectly solid body (see Fig. 4), the whole was then turned off to fit the cylinder, steam rings fitted to it, the rings being made in two parts, the ends dovetailed with brass keepers. The bent piston rod was hung in a lathe and a large blow torch heated it, while a steady pressure was exerted on it with a hydraulic jack, and, contrary to the expectations of the skeptics, the rods were so trued by this method that a 1-64 cut was all that was needed to finish them.

One drawback to a solid piston in a large engine is that the piston and rod must be backed out of the cylinder in order to examine or replace the steam ring. An ingenious

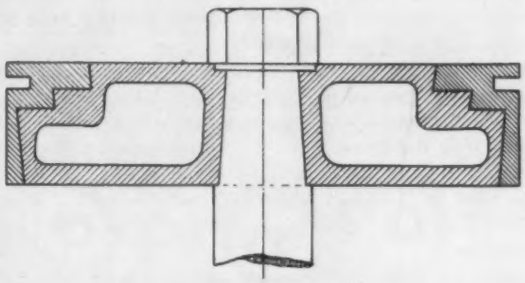


Fig. 4.

method of turning the rod out of the cross-head was devised at this station. When the engine was on the dead center, the nut on the piston was several inches inside of the cylinder, making it very difficult to attach a line on the nut to turn it. A wrench was made (shaped like a drum or niggerhead on a winch), the inside being hollow and hexagon shaped, to slip on the nut on the face of the piston, the wrench or drum then projected past the edge of the cylinder far enough to allow a stout line to be passed around it several turns. The end of the line was attached to the hook of the overhead crane, which heaved away and turned the piston and rod out of the crosshead in a short time. By shifting the hauling part of the line to the opposite side of the drum, the rod could be screwed back in place.

D. THOMAS,
Secretary of California No. 3.

NEW CATALOGUES.

The Western Electric Company are distributing from their various offices, printed matter calling attention to the good features of the Hawthorn Short Arc Lamp, Hawthorn Rosin Core Solder and the Hawthorn Magneto Test Set.

The Electric Goods Manufacturing Company of Boston, are distributing some very convincing printed matter describing the Avonial and Hub Annunciators of their manufacture which can be supplied both with and without telephone. Included with this printed matter is an attractive hanger which shows in a concise way 20 points of superiority of the Hub Annunciator. The Aylsworth Agencies Company, San Francisco, represent this company upon the Pacific Coast.

The Standard Electrical Works, San Francisco, are distributing a new catalogue just issued covering single phase motors manufactured by the Century Electric Company, St. Louis, whom they represent on the Pacific Coast. A considerable portion of the catalogue is devoted to the application of this type of motor to the operation of various kinds of machinery and is unusually interesting in this respect. Copies will be mailed by the above company on request.

B. C. HOLST LEAVES SAN FRANCISCO.

B. C. Holst, manager of the telephone sales department of the Western Electric Company at San Francisco, will retire from his present position on August 15th to take up work of a similar character with the Northern Electric & Manufacturing Company, Ltd., of Montreal and Winnipeg, the Canadian branch of the Western Electric Company. He will leave on August 15th for Montreal, the headquarters of the company, and after spending a month at that point will locate in Vancouver, B. C., at which point he will represent the company. Mr. Holst was formerly associated with the Western Electric Company at Chicago, after which he served for a brief period in the sales department of the Central Electric Company, Chicago, coming to the Coast in April, 1906. He located at San Francisco within a few days after the memorable fire of that month and with other employees of the Western Electric Company passed through the severe work of reorganization under the conditions which existed at that time. He has become closely identified with the electrical supply business in this territory and his many friends will be gratified to know that this change is in recognition of his good work at this point.

CONVENTION OF THE HOLOPHANE COMPANY.

The fifth annual convention of the Holophane Company was held at Association Island, Henderson Harbor, New York, from June 12th to June 19th and included every Holophane traveling representative, branch manager and department head.

Eight business sessions were held at which every phase of the business was discussed and following the discussion the policy for the year was mapped out.

Some Members of the Sales Department—Holophane Convention.

During the convention three days were given over entirely to sports and excursion trips, with the object of bringing the various representatives together socially and of offering opportunity for the making of new friendships and the renewal of old.

The management and employees of the company feel that this was by far the most successful annual meeting ever held and it is expected that the plans and policies adopted for the coming year will greatly strengthen the position of Holophane glass, both at home and abroad.

INDUSTRIAL

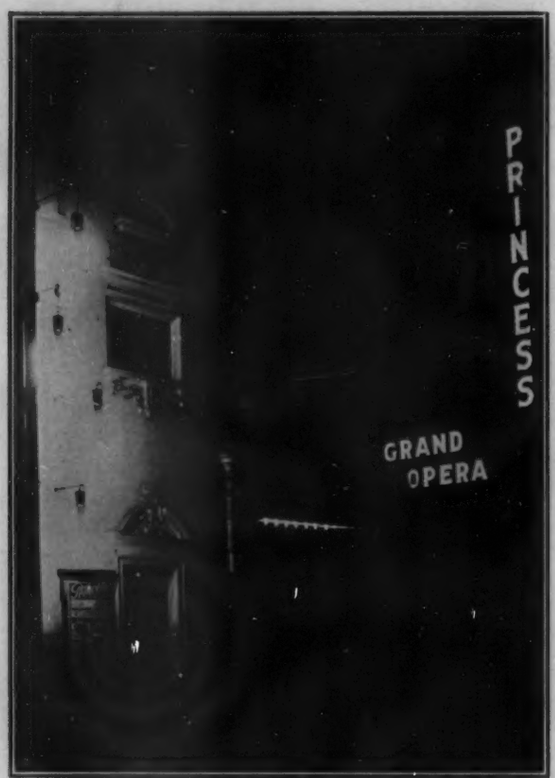
ELECTRICAL DEPARTMENT OF PARROTT & CO.

Parrott & Co., well known on the Pacific Coast and abroad, have added an electrical department to the many varied lines they handle as Manufacturers' Agents. With their numerous offices and representatives on the Coast and in foreign countries, they are in position to handle business of this character to the best advantage.

Among the specialties the newly organized electrical department handles is the Grant Flaming Arc Lamp. This lamp is now well known on the Pacific Coast, and is in use by some of the largest industrial corporations in the world.

A large percentage of the piers and wharves of New York City are equipped with this type of lamp; among the users on the Pacific Coast may be mentioned the Colman Dock, Canadian Pacific Railroad Company, Winton Motor Car Company, Orpheum Theater, Seattle Theater, Seattle Athletic Club and Oriental Pool Rooms of Seattle, Wash.; the Postal Telegraph Cable Co., Standard Oil Co., Western Automobile Mfg. Co., Princess Theater and Novelty Theater, San Francisco; the Broadway and Camera Theaters, Oakland, Cal.

The Flaming Arc is fast revolutionizing all that department of illumination to which arc lighting is applicable. Its



Princess Theatre, San Francisco, Illuminated by Grant Flaming Arc Lamps.

superiority over the ordinary arc is shown in the color of the light, the absence of deep shadows, far greater brilliancy and economy of current consumption.

The Grant Arc Lamp possesses all of these advantages and the particular claims made for it are based on its extreme simplicity of construction.

The economy of the Flaming Arc can best be illustrated by the following tables:

Relative Candle Power for 1200 watts:

24	c. p. Incandescent Lamps	384 c. p.
2	Enclosed Arcs	600 c. p.
2	Flaming Arcs	6000 c. p.

To develop 6000 candle power requires:

375	16 c. p. Incandescent Lamps	18.75 k. w.
20	Enclosed Arcs	12. k. w.
2	Flaming Arcs	1.2 k. w.

Allowing an efficiency of 100 per cent to the flaming arc, ordinary enclosed arcs have only 10 per cent, and incandescent lamps 8 per cent efficiency.

The difference in brilliancy of the two types of arcs is due to the fact that in the ordinary arc the light is produced by the combustion of the carbon itself, which is a poor radiator, while in the flaming arc the space between the ends of the carbon is filled with a molecular substance liberated from the carbons by the electric current, the combustion of which produces a flame of intense brilliancy with powerful radiating qualities.

The globe presents the appearance of a solid ball of flame and the light is diffused so uniformly that no heavy shadows are cast. It is practically flickerless.

A room containing 10,000 square feet of floor space is so well lighted by one Grant lamp that a newspaper can be read in every part.

The electrical department of Parrott & Co. also handles a full line of incandescent lamps, "Zurich" carbons for arc lamps, Peerless transformers, Kimble variable speed single-phase motors, Diehl direct-current motors and generators, switchboards, panel boards, Heany fireproof wire, etc.

NERNST LAMPS FOR INSTANTANEOUS LIGHTING.

The instantaneous lighting Westinghouse Nernst lamps exhibited at the Atlantic City convention of the National Electric Light Association mark another important step in the development of the glower system. This development added to the improved quality of light and increased efficiency produced by the new type of glower indicates that the glower system is here to stay.

The desirable feature of lighting instantaneously is accomplished by the substitution of a new form of heater for the old platinum heater. This heater becomes luminous immediately upon the passing of the current and in addition to producing light instantenously is so constructed that it causes the glower itself to light in ten seconds.

The Nernst Company announces that on and after July first, it will be prepared to deliver 88, 110 and 132 watt, 220 volt type alternating current and direct current lamps equipped with the instantaneous lighting burners.

STEAM TURBINE BUSINESS OF THE ALLIS-CHALMERS COMPANY.

The Allis-Chalmers Company has, of late, been shipping out a large number of steam turbines to fill recent contracts, among the number being machines of 500 to 3500 k. w. capacity for the Brush Electric Light & Power Co., Galveston, Texas; Oak Park Power Company, Flint, Mich.; Savannah Electric Company, Savannah, Ga.; Florida Mining Company, Mulberry, Fla.; Glenlyon Dye Works, Phillipsdale, R. I.; Willamette Valley Company, Springfield, Ore.; Pacific Mills, Lawrence, Mass.; Cia Electrica y de Ferrocarriles de Chihuahua, Mexico, and Oshkosh Gas Light Company, Oshkosh, Wis.

NEWS NOTES

FINANCIAL.

PORTLAND, ORE.—The Neptune Meter Company has been awarded the contract for supplying the city with 5000 Trident water meters. Their bid was $44,940.

SPOKANE, WASH.—The Council has adopted a resolution instrucing the corporation council to prepare an ordinance for a $400,000 bond issue for the purpose of extending the water system.

GLENDALE, CAL.—The City Council passed Ordinance No. 99 providing for issuing bonds of the city in the sum of $60,000 for the acquisition, construction and completion of the Glendale Electric Light Works.

KENT, WASH.—The election held here last week resulted in favor of bonding the city for a new water system. The water will be brought here from Jenkins creek, a distance of seven miles, and the estimated cost is $70,000.

OROVILLE, CAL.—The Supervisors sitting as a board of equalization, have cited the Great Western Power Company to appear before them and show cause why its assessment should not be raised from $264,000 to $2,750,000.

HELENA, MONT.—A special election will be held August 9th for the purpose of submitting to the voters the question of issuing bonds to the amount of $650,000 for the purpose of procuring a water supply and constructing a water system.

SAN FRANCISCO, CAL.—United Railroads earnings for May were $634,169, or $27,745 less than for the same month last year. For the first five months ending May 30th the earnings were $2,971,421, as compared with $2,790,260 in 1908.

SAN FRANCISCO, CAL.—The Parkside Transit Company has filed a deed turning over the street railway in Sunset and all its properties to the San Francisco Electric Railways Company. The transaction was made public some time ago, when it became known that the United Railroads, through the subsidiary company had secured the Sunset line.

OAKLAND, CAL.—The Spring Valley Water Company has registered a complaint against the assessment of its Alameda County holdings. The complaint was presented by Attorney A. E. Shaw to the County Supervisors sitting as a board of equalization. Shaw based his objections on the allegations that at least $2,500,000 worth of real property and improvements had been erroneously classified as personal and that many of the valuations were too high. Riparian rights, extensive tracts of land, easements, flumes, open ditches, wells, conduits and submarine pipes were, according to the protest, entered as personal property. In addition, the attorney said he could prove that they had been assessed in some instances at three times their entire first cost.

CHIHUAHUA, MEX.—Governor Creel states that this city is now considering the matter and will soon issue $600,000 worth of 5 per cent bonds for public improvements. The peoceeds of the bonds will go to the extention and improvement of the sewer and water systems of this capital. Plans and specifications for these improvements are already made.

HOLTVILLE, CAL.—At a meeting of citizens held here to discuss the water situation, W. F. Holt, owner of the domestic water system, made an offer to sell to the city at actual market value and turn over free of cost the plant as it now stands. The meeting passed resolutions favoring taking over the property and installing a modern distributing system. It is probable that a bond election will be called to vote on the proposition of raising the necessary money.

SAN DIEGO, CAL.—The San Diego, Cuyamaca & Eastern Railway, operating a steam and gasoline line between this city and Foster, a distance of 26 miles to the northeast, has been acquired by John D. Spreckels, and will hereafter be operated in conjunction with the various Spreckels transportation lines running in and out of San Diego. New articles of incorporation were filed, showing the purchase from R. C. Gillis of Los Angeles, trustee for the bond holders, who about a year ago took over the property from the Babcock estate. The new company is capitalized at $1,500,000, divided into shares of the par value of $100 each, all of which has been subscribed. The new directors of the company are William Clayton, vice president and managing director of the San Diego Spreckels companies, Harry L. Titus, J. F. Lamond and E. A. Hornbeck of San Diego, and C. L. Bundy of Los Angeles.

INCORPORATIONS.

REDDING, CAL.—Bella Vista Oil Company, capital stock $200,000, by C. L. Cofer of Red Bluff, president; J. R. Peterson and J. W. Riley.

LOS ANGELES, CAL.—Monte Vista Water Company, capital stock $75,000, by T. W. Trekendall, H. P. Wilkinson and H. J. Nichols of Pomona.

LOS ANGELES, CAL.—Ecuadorian Petroleum Company, capital stock $50,000, by H. A. Wilson, W. A. Barker, F. A. Barnes, J. W. Beam and W. R. Buckner.

SANTA ROSA, CAL.—Petaluma Economic Power and Patent Development Company, capital stock $100,000, subscribed $52,410, by F. A. Creed, 51,000 shares; Charles Roberts, 1000; S. J. Anderson and J. B. Dye, 200 each, and P. F. O'Connor, 10 shares.

TRANSMISSION.

BELLINGHAM, WASH.—A permit has been issued to the Thunder Creek Transportation and Smelting Company for the erection of a big power plant on Thunder creek where it flows into Skagit River, about 40 miles above Marblemount. It is planned to start construction this summer.

ETNA, CAL.—At the Headlight mine, which changed hands recently, it is proposed to take water out of Coffee Creek in the neighborhood of Morrison gulch to supply generation for an electric power plant, sufficient to run the thirty stamp mill the Headlight people are to put in.

OAKLAND, CAL.—The Board of Public Works has granted permission to the Great Western Power Company to erect poles from Trestle Glen to its plant at Sessions Basin. This action anticipates the granting of a franchise, which is now before the City Council for overhead and underground wires.

MERCED, CAL.—The South Fork Mining and Power Company, owning property on the South Fork in Mariposa County, has just finished its surveys for its flumes and power line. The company owns the Peach Tree and Panoche group of mining claims, and is preparing to build a power plant for its own use.

LOS ANGELES, CAL.—The first step towards municipal electric power was taken by the Council when it approved the recommendation of the Board of Public Works that $10,000 be set aside from general taxes for each of next two years to pay the cost of the preliminary work of establishing power plants along the line of the aqueduct.

BISHOP, CAL.—An order amounting to something over $5000 has been placed by the Bishop Creek Milling Company, for new power equipment at the Bishop Creek mine.

JACKSON, CAL.—All the rights of the Oleto Canal and Power Company, including the Purington and Eagle ditches and other water rights in Dry Creek and Cosumnes River, and 320 acres of mining ground in township 8, range 13, have been purchased by the Crystal Water Power Company, a new concern, not known here, for $40,000.

REDDING, CAL.—The Sacramento Valley Power Company with 4000 horsepower developed and water enough to develop a total of 10,000 horsepower, will soon extend its power lines south as far as Chico, expecting to find a market for its full output without building beyond Chico. The company is a consolidation of the Northern Light and Power Company and the Shasta Power Company.

ODESSA, WASH.—The City Council will grant a franchise to the Washington Water Power Company of Spokane to extend its lines to Odessa. The line will run from the Harrington-Sprague line, about 20 miles from here, and with the lighting system to be established will cost about $50,000. Lights will be ready by Christmas.

MIDDLETOWN, CAL.—Considerable interest is being manifested here in the project proposed by the combined forces of the Niagara Power Company and the California Land and Trust Association to dam Clear Lake and put in power plants. The companies claim they can develop 900 feet fall, and propose to put in three power houses, the first at 700 foot fall, the second at 150 foot fall and the third reaching Woodland, with a 50 foot fall. It is presumed the news of this big scheme is what started the activity in water rights in Yolo County.

FRESNO, CAL.—A deed recorded under date of June 22, 1909, between George A. and Frances H. Knight to Fresno Power Company of mill site and power station in 12-26 at the junction of Dinkey creek with the North Fork of Kings River, also water right to 30,000 inches flowing into the North Fork at a point of diversion in 12-27, being the appropriation made by F. G. Davis; also all right to a ditch projected to connect the power station with the point of diversion, also 50,000 inches of water from Kings River about 78 miles above the mouth of the North Fork of Kings River and two miles below the mouth of the South Fork of Kings River for power purposes to be diverted about 18 miles above the mouth of the North Fork of Kings River, and two miles below the mouth of the South Fork of the river on the north bank, being the water appropriation made by Sydney Sprout.

WOODLAND, CAL.—A rush is on to secure valuable water rights on Putah Creek, in Western Yolo, to use in developing irrigation and power in the vicinity of Winters. Four notices of location have just been filed. G. S. Turner and H. H. Sanborn, said to represent Sacramento and San Francisco syndicates, respectively, were the first filers, and next came M. A. Nurse, formerly engineer to the Commissioner of Public Works. Then came E. W. McKinley, Turner and Sanborn want to appropriate 1,000,000 inches, while Nurse reasonably asks for 20,000. Each applicant would divert waters at Devil's Gate, ten miles west of Winters, and with canals and flumes, carry it to the vicinity of Winters to use in both Yolo and Solano counties. One report is that the Wolfskill ranch and other large tracts are to be colonized and irrigated, the project being one of 80,000 acres.

ILLUMINATION.

TOLEDO, Ore.—The Council granted a franchise to H. L. Collins, A. C. Smith and J. F. Stewart for the erection and maintenance of an electric light plant in Toledo. Work on the plant will begin at once.

MEADOWS, IDAHO.—Chisholm & Goodman are at work on their plant which will furnish light and power sufficient to run everything in the valley.

NOGALES, ARIZ.—Ground has been broken for building of new gas works, which will cost about $50,000. Capital has been guaranteed by Cleveland parties.

SANTA MONICA, CAL.—The City Council has received two bids for wiring and fixtures for the pier. G. C. Chase & Co. bid $2785 and F. E. Wright bid $2805.

SEATTLE, WASH.—A contract has been let to Meacham & Babcock for the conduits and to the Olympic Iron Works for the poles for cluster lights on Second and Third avenues.

WILMINGTON, CAL.—The City Council has passed an ordinance granting the Pacific Electric Railway Company a right to construct and maintain for 50 years a railroad upon certain streets of this city.

VALLEJO, CAL.—Manager Albert Casper of the Vallejo Electric Light & Power Company, says a power line will be extended out Sacramento street in the Heights section of the city and also on Napa street, as far as the Napa road.

ELLENSBURG, WASH.—Contracts have been awarded to the Allis-Chalmers Company for the installation of an electric generator for the lighting plant at $8725 and to the Bates Clark Company of Seattle for an additional turbine.

ST. MARIOS, IDAHO.—A franchise has been granted to G. H. Jay for a light and power plant at a cost of about $50,000, work to commence as soon as agreements can be completed, and the town to be lighted within six months.

OAKLAND, CAL.—One mile of overhead electric wires will be put underground each year after the City Council passes an ordinance introduced by Councilman Everhart. The ordinance creates three new districts, in one of which the overhead wires and the poles will be removed each year for next three years. At the end of that period it is provided that other districts shall be mapped until the whole city is cleared.

SAN JOSE, CAL.—The Board of Supervisors has awarded to the Los Gatos Ice, Gas & Electric Company, a franchise to construct and operate a line of poles and wires for an electric light and power system in Santa Clara County for a period of 50 years. Manager J. D. Farwell of the company says that the concern intends to take in and serve practically all of the foothill country between Los Gatos and Palo Alto, Mayfield, Mountain View, Sunnyvale, Los Altos and vicinity will be connected with the local plant.

TRANSPORTATION.

CLAREMONT, CAL.—The City Council will receive bids up to August 23d for a franchise to construct and for fifty years to operate a single or double or three-track railway to be operated by electricity in this city.

FRESNO, CAL.—Sealed bids will be received by the Board of Trustees up to August 16th for a franchise for an electric street and interurban railroad as applied for by the Fresno, Hanford and Summit Lake Interurban Railway.

SACRAMENTO, CAL.—Plans and estimates are being prepared by the local officers of this railway company to be submitted to the officers at headquarters in San Francisco for the extension of the line on K street to the Western Pacific Company's depot on 19th, J and K. The extended line is proposed to be built from 15th and K to 19th, so that travelers over the Western Pacific line will have quick service to the business section of the city and the large hotels.